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OF

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ON

BIODIESEL BLENDED WITH ETHANOL ADDITIVE

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BIODIESEL BLENDED WITH ETHANOL ADDITIVE

BACKGROUND OF THE INVENTION

Cross-Reference to Related Application

This application is a utility application claiming priority from a provisional application filed January 12, 2001, entitled BIODIESEL BLENDED WITH ETHANOL ADDITIVE incorporated by reference herein.

Field of the Invention

The present invention relates to biodiesel fuels blended with an alcohol-derived additive, and more specifically, to biodiesel fuel with an ethanol additive to achieve a high cetane and cleaner emissions fuel.

Background

For many years, the use of fossil fuels has been an environmental concern. First, there is concern about depletion of fossil fuels. Second, perhaps more important, there is concern about emissions from the burning of fossil fuels. Several fossil fuel alternatives have been developed in order to address environmental concerns. One such group of fuels is referred to as biodiesel, a diesel fuel substitute derived from biomass, having a high fatty acid content such as tallow, yellow grease or other fatty acid ingredients or by-products. These high fatty acids are converted to biodiesel by a process known as transesterification.

Another biofuel is known as ethanol. It is typically derived form corn starch, but may be derived from other biomass as well. Another alcohol-based biofuel is methanol.

Typically, biodiesel fuel is used alone, or blended into diesel fuel, at various ratios, e.g., 80% diesel, 20% biodiesel, to reduce emissions.

A problem with biodiesel fuels has been achieving high cetane ratings. A high cetane rating is desirable because it indicates faster fuel ignition, which is especially useful in lower temperatures. A higher cetane number also means better fuel economy. What it needed is a renewable fuel source, preferably 100% renewable, with a higher cetane number.

SUMMARY OF THE INVENTION

The invention provides a biodiesel fuel blended with alcohol-based fuel such as ethanol. The blend improves cetane number and also improves the cleaning nature of the fuel, while reducing any geling at lower temperatures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In one embodiment, the invention provides a mixture of fifty percent (50%) or more and an alcohol-based fuel such as ethanol or methanol. Processes for making biodiesel fuel are well-known, e.g., U.S. Patent No. 5,713,965 to Foglia et al. entitled "Production Of Biodiesel, Lubricants And Fuel And Lubricant Additives" discloses a process for making biodiesel. Accordingly, U.S. Patent No. 5,713,965 is hereby incorporated by reference. Processes for making ethanol or other alcohol-based fuels are also well-known.

One suitable biodiesel fuel in accordance with the invention is made from nonpetroleum feed-stocks such as soybeans, canola seed and recycled vegetable grease or tallow, e.g., biodiesel sold under the trademark OXY-G™ by Southern States Power Company, Inc. of Shreveport, Louisiana. Such a biodiesel is produced from a used oil source by a process including sulfuric acid, dry methanol, dry potassium hydroxide (KOH), and water, put through a series of processing and blending. After forming the biodiesel, i.e., after the final blend, the alcohol-based fuel, such as ethanol, is blended with it. The blending may occur by flash blending, centrifuge, or other means, and preferably occurs after a step of dry ester surge (explain). The resultant composition may then be stored, or used at that point. The ethanol added is any ethanol after a dry or wet milling stage. A preferred ethanol is made from corn starch, and ethanols with enhanced octane ratings.

The alcohol-based fuel additive unexpectedly enhances the cetane numbers of the biodiesel fuel. It also improves the cleaning ability of the biodiesel fuel, e.g., carbon deposit

cleaning. In the past, in colder regions, biodiesel could gel. Therefore, petroleum or kerosene were added. Normally, antigel properties are achieved by adding less than two percent by volume.

Often, biodiesel fuel is blended with diesel fuel, typically in a volume ratio of one to four, i.e., one part biodiesel to four parts diesel. In the examples below, the resultant biodiesel fuel blended with ethanol (and without blending) was tested when mixed one to four with diesel fuel.

Example 1

80% biodiesel made from tallow (e.g., vegetable oil and/or grease trap), sold under the trademark OXY-G™ and available from Southern States Power Company, was blended with 20% ethanol made from dated or out of specification soft drinks, wine, and/or other beverages, and/or molasses, and obtained from Parallel Products in Rancho Cucamonga, California. The ethanol was blended with the biodiesel by splash blending. The resultant biodiesel and diesel composition was tested for cetane level by testing the combustion products, and achieved a cetane index level of 62.9, as compared with 61.7 for 100% biodiesel mixed with diesel. The cleaning effect of the resultant biodiesel and diesel composition was improved using the 80% biodiesel/20% ethanol blend (over using 100% biodiesel mixed with diesel as determined by observation). The diesel fuel with the biodiesel and ethanol blend also exhibited an enhanced antigel property - i.e., was more resistant to thickening of the fuel in cold temperatures. This

was observed by bench scale testing for the diesel fuel using the 80%/20% blend as compared to the diesel fuel using 100% biodiesel.

For comparison purposes, it is noted that pure diesel products were tested for cetane level and are as follows:

Texaco's Equillon™ CARB-approved diesel	41.9 cetane index
Arco's CARB-approved diesel	51.7 cetane index
Ultramar's CARB-approved diesel	41.0 cetane index
Chevron's CARB-approved diesel	49.8 cetane index

Example 2

93% biodiesel manufactured under the trademark OXY-G™ was mixed with 7% ethanol of the same type as used in Example 1 above. The resultant composition was mixed with diesel in a 1 to 4 ratio and was tested for cetane level. It achieved a cetane level of 92.3 as compared with 61.7 for 100% biodiesel mixed with diesel in a 1 to 4 ratio. The cleaning effect of the diesel using the biodiesel and ethanol blend was improved over the 100% biodiesel and diesel mixture as determined by observation. The diesel using the biodiesel and ethanol blend also exhibited an enhanced antigel property over the diesel using 100% biodiesel.

Example 3

95% biodiesel manufactured under the trademark OXY-G™ was mixed with 5% ethanol of the same type as in Example 1 above. The resultant composition was mixed with diesel in a 1 to 4 ratio and was tested for cetane level. It achieved a cetane level of 93.4 as compared with 61.7 for 100% biodiesel mixed with diesel in a 1 to 4 ratio. The cleaning effect of the diesel using the ethanol blended biodiesel was improved over the diesel using the nonblended biodiesel, as determined by observation. The diesel using the ethanol-blended biodiesel also exhibited an enhanced antigel property as compared with the diesel using biodiesel without ethanol.

It is believed that the use of too little ethanol or other alcohol-based additive will provide no significant cetane improvement, or no improvement. It is further believed that the use of too much ethanol additive or other alcohol-based additive may create a loss of compatibility with a diesel engine. However, higher amounts of ethanol (higher than 20%) and lower amounts of biodiesel (lower than 80%) to about a fifty percent (50%) blend of each may be useful for some situations.